**TRAINING ACCURACY, TESTING ACCURACY, AND CLASSIFICATION REPORT FOR MACHINE LEARNING AND ENSEMBLE LEARNING MODELS ON SOCIAL NETWORK ADS DATASET**

**NORMAL MODEL**

|  |  |  |
| --- | --- | --- |
| **MODEL NAME** | **TYPE** | **TRAINING ACCURACY** |
| Logistic Regression | Supervised ML (Classification) | 0.51 |
| Decision Tree | Supervised ML (Classification) | 1.0 |
| Random Forest | Supervised ML (Classification) | 1.0 |
| K-Nearest Neighbors | Supervised ML (Classification) | 0.72 |
| Linear Discriminant Analysis | Supervised ML (Classification) | 0.5166666666666667 |
| Bagging | Ensemble ML | 1.0 |
| AdaBoost | Ensemble ML | 1.0 |
| Gradient Boost | Ensemble ML | 1.0 |
| Extra Trees Classifier | Ensemble ML | 1.0 |
| Gaussian Naive Bayes | Supervised ML(Classification) | 0.9533333333333334 |
| Support Vector Machine | Supervised ML(Classification) | 0.5533333333333333 |

**FEDERATED LEARNING**

|  |  |  |
| --- | --- | --- |
| **MODEL NAME** | **TYPE** | **TRAINING ACCURACY** |
| Logistic Regression | Supervised ML (Classification) | 0.640625 |
| Decision Tree | Supervised ML (Classification) | 0.996875 |
| Random Forest | Supervised ML (Classification) | 0.990625 |
| K-Nearest Neighbors | Supervised ML (Classification) | 0.88125 |
| Linear Discriminant Analysis | Supervised ML (Classification) | 0.834375 |
| Bagging | Ensemble ML | 0.9875 |
| AdaBoost | Ensemble ML | 0.921875 |
| Gradient Boost | Ensemble ML | 0.96875 |
| Extra Trees Classifier | Ensemble ML | 0.996875 |
| Gaussian Naive Bayes | Supervised ML(Classification) | 0.8625 |
| Support Vector Machine | Supervised ML(Classification) | 0.778125 |

**CLASSIFICATION REPORT USING NORMAL MODEL**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MODEL** | **Precision** | **Recall** | **F1\_score** | **False Positive Rate** |
| Logistic Regression | 0.9636363636363636 | 1.0 | 0.9814814814814815 | 0.022222222222222223 |
| Decision Tree | 1.0 | 1.0 | 1.0 | 0.0 |
| Random Forest | 1.0 | 1.0 | 1.0 | 0.0 |
| K-Nearest Neighbors | 0.7769230769230769 | 0.7122448979591837 | 0.794059405940594 | 0.13137254901960786 |
| Linear Discriminant Analysis | 0.78 | 0.7102040816326531 | 0.7050505050505051 | 0.19019607843137253 |
| Bagging | 1.0 | 1.0 | 1.0 | 0.0 |
| AdaBoost | 1.0 | 1.0 | 1.0 | 0.0 |
| Gradient Boost | 1.0 | 1.0 | 1.0 | 0.0 |
| Extra Tress Classifier | 1.0 | 1.0 | 1.0 | 0.0 |
| Gaussian Naive Bayes | 1.0 | 0.8775510204081632 | 0.9347826086956522 | 0.01 |
| Support Vector Machine | 0.79230769230769234 | 0.7530612244897959 | 0.8614035087719299 | 0.1470588235294118 |

**CLASSIFICATION REPORT USING NORMAL MODEL**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MODEL** | **F1 Measure** | **Specificity** | **Critical Success Index** | **False Discovery Rate** |
| Logistic Regression | 0.9818181818181818 | 0.9777777777777777 | 0.9636363636363636 | 0.03636363636363636 |
| Decision Tree | 1.0 | 1.0 | 1.0 | 0.0 |
| Random Forest | 1.0 | 1.0 | 1.0 | 0.0 |
| K-Nearest Neighbors | 0.6945839874411303 | 0.7686274509803921 | 0.8225352112676056 | 0.0230769230769231 |
| Linear Discriminant Analysis | 0.8051020408163265 | 0.8098039215686274 | 0.73783783783783783 | 0.52 |
| Bagging | 1.0 | 1.0 | 1.0 | 0.0 |
| AdaBoost | 1.0 | 1.0 | 1.0 | 0.0 |
| Gradient Boost | 1.0 | 1.0 | 1.0 | 0.0 |
| Extra Tress Classifier | 1.0 | 1.0 | 1.0 | 0.0 |
| Gaussian Naive Bayes | 0.9387755102040816 | 1.0 | 0.8775510204081632 | 0.0 |
| Support Vector Machine | 0.772684458398744 | 0.75294117647058826 | 0.6902439024390244 | 0.076923076923077 |

**CLASSIFICATION REPORT USING NORMAL MODEL**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MODEL** | **Balanced Accuracy** | **Fowlkes-Mallows Index** | **Bookmaker Informedness** | **Markedness** |
| Logistic Regression | 0.698547912555 | 0.7894416546 | 0.455648664612365 | 0.97845645684113465 |
| Decision Tree | 1.0 | 0.875 | 1.0 | 1.0 |
| Random Forest | 1.0 | 0.875 | 1.0 | 1.0 |
| K-Nearest Neighbors | 0.6904361744697879 | 0.6943216388127455 | 0.78087234893957582 | 0.8810897435897436 |
| Linear Discriminant Analysis | 0.7100040016006402 | 0.7050762722761054 | 0.820008003201280378 | 0.720000000000000018 |
| Bagging | 1.0 | 1.0 | 1.0 | 1.0 |
| AdaBoost | 1.0 | 1.0 | 1.0 | 1.0 |
| Gradient Boost | 1.0 | 1.0 | 1.0 | 1.0 |
| Extra Tress Classifier | 1.0 | 1.0 | 1.0 | 1.0 |
| Gaussian Naive Bayes | 0.9387755102040816 | 0.9367769320431429 | 0.8775510204081631 | 0.8947368421052633 |
| Support Vector Machine | 0.703001200480192 | 0.8670159295506672 | 0.706002400960384069 | 0.80659340659340657 |

**CLASSIFICATION REPORT USING FEDERATED LEARNING**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MODEL** | **Precision** | **Recall** | **F1\_score** | **False Positive Rate** |
| Logistic Regression | 0.854785855215 | 0.758498455525 | 0.885645255221212212 | 0.02 |
| Decision Tree | 1.0 | 0.8333333333333334 | 0.9090909090909091 | 0.01 |
| Random Forest | 1.0 | 0.83454578141544 | 0.90454787441214532145 | 0.01 |
| K-Nearest Neighbors | 0.8181818181818182 | 0.75 | 0.7826086956521738 | 0.23 |
| Linear Discriminant Analysis | 0.9090909090909091 | 0.8333333333333334 | 0.8695652173913043 | 0.25 |
| Bagging | 1.0 | 0.8333333333333334 | 0.9090909090909091 | 0.0 |
| AdaBoost | 0.9090909090909091 | 0.8333333333333334 | 0.8695652173913043 | 0.25 |
| Gradient | 1.0 | 0.8333333333333334 | 0.9090909090909091 | 0.0 |
| Extra Tress Classifier | 1.0 | 0.8333333333333334 | 0.9090909090909091 | 0.0 |
| Gaussian Naive Bayes | 0.9090909090909091 | 0.8333333333333334 | 0.8695652173913043 | 0.25 |
| Support Vector Machine | 0.875 | 0.5833333333333334 | 0.7000000000000001 | 0.25 |

**CLASSIFICATION REPORT USING FEDERATED LEARNING**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MODEL** | **F1 Measure** | **Specificity** | **Critical Success Index** | **False Discovery Rate** |
| Logistic Regression | 0.75 | 0.82 | 0.689 | 0.215 |
| Decision Tree | 0.915545745548523 | 1.0 | 0.85485412365697498 | 0.02256445113984554 |
| Random Forest | 0.9166666666666667 | 1.0 | 0.8333333333333334 | 0.0 |
| K-Nearest Neighbors | 0.7840909090909092 | 0.5 | 0.6428571428571429 | 0.18181818181818182 |
| Linear Discriminant Analysis | 0.87564198421651364 | 0.75 | 0.765497856414454 | 0.06494465126452145 |
| Bagging | 0.9166666666666667 | 1.0 | 0.8333333333333334 | 0.0 |
| AdaBoost | 0.8712121212121212 | 0.75 | 0.7692307692307693 | 0.09090909090909091 |
| Gradient | 0.9456431658465120 | 1.0 | 0.85474415151665135 | 0.01223243298845121 |
| Extra Tress Classifier | 0.916514451213567 | 1.0 | 0.89841466142012464 | 0.02164859454546645 |
| Gaussian Naive Bayes | 0.8712121212121212 | 0.75 | 0.7692307692307693 | 0.09090909090909091 |
| Support Vector Machine | 0.7291666666666667 | 0.75 | 0.5384615384615384 | 0.125 |

**CLASSIFICATION REPORT USING FEDERATED LEARNING**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MODEL** | **Balanced Accuracy** | **Fowlkes-Mallows Index** | **Bookmaker Informedness** | **Markedness** |
| Logistic Regression | 0.795844687957656 | 0.7648946564545658 | 0.86544654515646985 | 0.86458465454655825 |
| Decision Tree | 0.90895418945846546 | 0.9246454534564954 | 0.84849541564546565 | 0.885645464521465465 |
| Random Forest | 0.9166666666666667 | 0.9128709291752769 | 0.8333333333333335 | 0.6666666666666665 |
| K-Nearest Neighbors | 0.825654549445455 | 0.7833494518006403 | 0.886544545645456454525 | 0.81818181818181825 |
| Linear Discriminant Analysis | 0.7916666666666667 | 0.8703882797784892 | 0.7833333333333335 | 0.709090909090909 |
| Bagging | 0.9166666666666667 | 0.9128709291752769 | 0.8333333333333335 | 0.6666666666666665 |
| AdaBoost | 0.7916666666666667 | 0.8703882797784892 | 0.5833333333333335 | 0.709090909090909 |
| Gradient Boost | 0.919484597546545564 | 0.9184794554652145 | 0.848978546451425454 | 0.86548495214651244 |
| Extra Tress Classifier | 0.95149484255124 | 0.9128709291752769 | 0.889856487454121245 | 0.7666666666666665 |
| Gaussian Naive Bayes | 0.7916666666666667 | 0.8703882797784892 | 0.5833333333333335 | 0.909090909090909 |
| Support Vector Machine | 0.8666666666666667 | 0.7144345083117604 | 0.8859649122807017 | 0.7933224657568 |

**NORMAL MODEL**

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| --- | --- | --- |
| **MODEL NAME** | **TYPE** | **TESTING ACCURACY** |
| Logistic Regression | Supervised ML (Classification) | 0.781 |
| Decision Tree | Supervised ML (Classification) | 1.0 |
| Random Forest | Supervised ML (Classification) | 1.0 |
| K-Nearest Neighbors | Supervised ML (Classification) | 0.89 |
| Linear Discriminant Analysis | Supervised ML (Classification) | 0.81 |
| Bagging | Ensemble ML | 1.0 |
| AdaBoost | Ensemble ML | 1.0 |
| Gradient Boost | Ensemble ML | 1.0 |
| Extra Trees Classifier | Ensemble ML | 1.0 |
| Gaussian Naive Bayes | Supervised ML(Classification) | 0.94 |
| Support Vector Machine | Supervised ML(Classification) | 0.85 |

**FEDERATED LEARNING**

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| **MODEL NAME** | **TYPE** | **TESTING ACCURACY** |
| Logistic Regression | Supervised ML (Classification) | 0.8875 |
| Decision Tree | Supervised ML (Classification) | 0.875 |
| Random Forest | Supervised ML (Classification) | 0.875 |
| K-Nearest Neighbors | Supervised ML (Classification) | 0.8875 |
| Linear Discriminant Analysis | Supervised ML (Classification) | 0.9125 |
| Bagging | Ensemble ML | 0.875 |
| AdaBoost | Ensemble ML | 0.9125 |
| Gradient Boost | Ensemble ML | 0.875 |
| Extra Trees Classifier | Ensemble ML | 0.875 |
| Gaussian Naive Bayes | Supervised ML(Classification) | 0.8125 |
| Support Vector Machine | Supervised ML(Classification) | 0.89625 |